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SPE NEWS

SPE NEWS

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Vol 2 No. 8 October 1946

PLASTICS PRODUCT OF RESEARCH

By MICHAEL FROELICH

The incongruous situation in which the plastics industry finds itself today has few parallels. Picture the full files of orders representing business which normally could keep everyone going full blast 24 hours a day. Then, stack that up against the comparative trickle of raw materials, and you have the uncertainty, the floundering about, and the unusual hesitancy which now characterize the business activities of so many of our associates.

Yet, the situation is not wholly confined to the plastics industry. Others, also, are being hit hard by shortages of one sort or another. The condition, generally, is one which plagues the entire country at this time.

Various explanations suggested by persons affected by the shortages, as well as those not directly concerned, are slowness in building materials delivery which holds up new plant construction; delays in manufacture and shipment of additional processing equipment; strikes and labor shortages; unprecedented demands for goods and merchandise; causes stemming from troubles in allied industries; and so on and on.

The causes are there, and they are real. Nevertheless, we must never lose sight of the basic fact that the plastics industry is wholly a creation of research. It lives and it progresses by what its designers and its engineers are able to achieve in the testing and development laboratories. The discoveries of these men and their findings, govern and control the future success of our industry, and any lagging on their part at this time because of events over which they may, or may not have any control, will most definitely have a most unfavorable reaction.

The makers of plastics materials are the fundamentalists of our industry, and it is natural that they should have been the prime promotors of research. This they have done and are still doing, excellently and progessively. But, there is a great need that they should be joined in this work by the manufacturers of allied equipment—manufacturers, whose research progress has been least advanced, perhaps because there are so many small-scale producers who cannot afford or think they cannot afford to engage in basic research.

All of us, no matter how big or how small we are, should join in this work, and cooperate wherever possible to attain the greatest good for the greatest number. Directly, this will be to the benefit of the entire industry of which each one of us is just as important a part as the next.

(Continued on Page 10)

Michael H. Froelich, our "Guest Editor" for this month, is Vice President and Editorial Director of Ziff-Davis Publishing Company, and Editor of "Plastics."

A native New Yorker, Mr. Froelich was educated in the New York public schools and studied journalism and business at N.Y.U., and law at the Brooklyn Law School at St. Lawrence University from 1924-1932. His career since then ranges from driving a truck to editing school text books and industrial publications. Mr. Froelich was managing editor of "Air Transportation" from 1928-30; "Aviation Engineering" from 1930 to 1932; and "Aero Digest," 1932-43, during which times he wrote extensively on all phases of aviation.

Coming to Ziff-Davis in 1943 as Assistant to the Publisher on "Flying," Mr. Froelich still supervises that publication. However, in 1944, with the war giving impetus to the growth of the plastics industry, Ziff-Davis launched "Plastics," and Mr. Froelich was named Editor.

In addition to his rather strenuous life in the publishing business, Mr. Froelich manages to find time for his many hobbies: youth education, tennis, fishing, hunting and flying. He belongs to the following technical organizations, Society of Automotive Engineers, Institute of Aeronautical Sciences, and the Society of Plastics Engineers.

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SHOW OPENING ADVANCED

The Third Annual Plastics Show and convention of the Society of Plastics Engineers, Inc., now has the "green light" and is being pushed forward on all fronts, it is announced by J. O. Reinecke of Barnes & Reinecke, Inc., Chicago, General Chairman. The show will be held on famed Navy Pier. The dates of the Show have been slightly changed—it will now open on Saturday, January 25, and run through January 31. The dates of the Technical Meeting at the Congress Hotel, however, remain the same, Monday, January 27, through January 31st. The changing in the opening date was made in order to eliminate the double time pay required by the show carpenters, electricians and other workmen for working on Saturday and Sunday on setting up exhibits, Mr. Reinecke explained. This should result in substantial savings in labor cost to the exhibitors.

The Show and Convention Committee met in Chicago October 15 and again October 25, to hear of progress along all lines. The slogan for the affair is "Too Good to Miss." The Show will be open to the public, with certain afternoon hours during the week restricted to the trade. W. B. Hoey, 203 Theatre Building, Birmingham, Michigan, Executive Secretary of SPE, is Show Exhibits Chairman, and he is issuing a floor plan and brochure to prospective exhibitors.

"This will be the first post-war show to be held on mile-long Navy Pier," pointed out Chairman Reinecke. "It is the first time SPE met in Chicago, too, which has become a leading center of the plastics industry.

"A style show, a home utilities show and numerous activated exhibits in the plastics industry are all being arranged for our get-together," he added.

During the Technical Meeting sessions to be held at the Congress Hotel concurrent with the show, some thirty papers will be presented by outstanding members of the plastics and allied industries, according to William L. Hess, Anesite Company, Chicago, Chairman of the Meetings Committee.

Hotel space of 500 rooms has been secured at the Congress Hotel, and requests for reservations should be sent to Daniel Amico, director of sales, Congress Hotel, 520 S. Michigan Avenue, Chicago.

The Annual SPE Banquet is scheduled for Thursday evening, January 30, and a nationally known speaker will be the feature of the evening.

Technical Article In This Issue

Thermoplastic or Thermosetting ------ Page 3

By Warren V. Prince

Candidates Nominated for National Directors

The following candidates have been nominated for the election of National Directors:

Buffalo Section:
E. A. Russell
Norman E. Wahl

Detroit Section:
R. G. Dailey
Frank W. Less

Philadelphia Section:
Ray V. Beshgetoor
Richard B. Bishop

Toledo Section:
Paul F. Corbin
Purcell De Han

Four new Directors will be elected from the eight candidates to serve for three years, beginning next January.

Ballots will be sent to each Member in good standing in about three weeks.

The report of the Nominating Committee was received too late to include biographies of the candidates in this issue of SPE News, but there will be a story on each candidate in the November issue of our magazine.

Rhode Island and Southeastern Massachusetts Section Organizes

The Rhode Island and Southeastern Section of SPE was organized at a meeting on September 10th at the Providence-Biltmore Hotel in Providence, R. I. This meeting was arranged by Mr. W. J. Dunnican (Durite Plastics), New England Regional Chairman of the National Membership Committee.

The following Section directors were elected: John Stenberg (Plastimold Corp.), Rudy Jacob (Cranston Molding Company), Arthur Richardson (Lloyd Products Company), E. Sheldon Smith (Spencer Thermostat Company), William R. Augat (W & A Company), Fred Novack (Leviton Mfg. Company), George R. Goodwin (Miller Electric Company), A. H. Angel (Angel Electroforming Corp.), and Edwin G. Hampel (W & A Company).

Section officers are: Mr. Stenberg, President; Mr. Jacob, Vice President; Mr. Richardson, Treasurer; and Mr. Smith, Secretary.

Rhode Island and Southeastern Massachusetts Section provides SPE facilities in an area in which there is great plastics activity, and it is expected that this new Section will prove to be very active in SPE affairs.

THERMOPLASTIC OR THERMOSETTING

By WARREN V. PRINCE

Warren V. Prince is President of Prince Industrial Plastics Corp. of Cleveland. He is well known as a writer on plastics, has held most of the important offices in the Cleveland Section of SPE, of which he was president until he left Cleveland last month, and was the first editor of the News-Bulletin. This important article is reprinted by courtesy of Tool and Die Journal.

Plastics materials are divided into two general classifications by their reaction to the application of heat—thermoplastic materials and thermosetting materials. Generally speaking these two groups differ widely in their molding and fabricating techniques; they differ as widely in the application of their physical characteristics in service as finished products.

A thorough understanding of the differences between thermoplastic and thermosetting materials is of vital importance to anyone in the plastics field; this is particularly true for those men who must make decisions on the selection of materials. Such decisions should depend upon, first, the manner in which the plastics is to be used as a finished product and, second, upon the facilities at hand, together with the cost of producing the product. A knowledge of the fundamental characteristics of these two types of materials can save much time and money.

Thermoplastic materials are softened by heat and become hardened upon cooling. They may be resoftened time and time again; thus the word "thermoplastic".

Thermosetting materials are softened by heat at the time of molding or fabricating but are hardened by continuing that heat in the molding process until a chemical change take place within the material, making it permanently infusible. Thus the word "thermo-setting." This chemical change is known as polymerization. Among molders it is generally referred to as "curing."

Thermoplastic materials may be likened to glass or sealing wax which can be melted over and over again. Thermosetting materials may be likened to concrete which, when once set up, becomes permanently hard and infusible. Thermoplastic materials are occasionally referred to as "cold-set" materials, whereas the thermosetting materials are referred to as "hot-set" materials.

Following are some of the outstanding characteristics of thermoplastic and thermosetting materials. Contrasting characteristics are in a parallel series. Bear in mind that these characteristics are not to be compared with materials other than plastics but are to be compared only between thermoplastic and thermosetting materials.

Thermoplastic:

1. Can be remelted
2. Hardens as a result of cooling
3. Poor dimensional stability
4. Soft
5. Tough
6. Has cold flow properties
7. Softened by heat
8. Becomes brittle when cold
9. Less fabrication time required (except with compression molding)
10. Scrap can usually be reclaimed and reused
11. Plasticizers control physical properties
12. Nearly all are flexible

Thermosetting:

1. Cannot be remelted after molding
2. Hardens from heat during molding or fabricating
3. Good dimensional stability
4. Hard
5. Brittle
6. No cold flow properties
7. Unaffected by heats from 240° F and up
8. Does not get brittle when cold
9. More fabrication time required
10. Scrap cannot be salvaged
11. Fillers control physical properties
12. Rigid even in thin sections

Thermoplastic materials as a class have poor dimensional stability; that is, they have a tendency to warp and change their shape with varying conditions. Some of these are:

1. Changes in humidity
2. Evaporation of plasticizers from the material
3. Temperature changes
4. Cold flow properties, resulting usually from forces applied
5. Absorption of liquids or certain chemicals

All but a very few plastics materials absorb moisture in varying amounts. If more moisture is absorbed on one side of a thermoplastic box, for example, than on the other side, the side exposed to the moisture will swell and expand more than the other side, causing a warpage. As a result, uneven strains or forces are set up within the material, cold flow begins and causes a permanent change of shape in yielding to such forces. Later, should the absorbed moisture leave the side of the box, the material would not return to its original shape if it had warped badly enough to cold flow.

Plasticizers are chemicals added to thermoplastic materials during their manufacture to give them

certain desired properties. Sometimes these plasticizers evaporate slowly from the material even after molding and cause the material to shrink and crack. This type of trouble developed in the earlier automotive plastic steering wheels. You may recall how many of them cracked and pulled apart. This can be reduced, however, by adding such plasticizers as camphor during material manufacture to retard the evaporation of other plasticizers.

If you have ever laid a thermoplastic part on a hot radiator or on top of an oven by mistake and, to your dismay, noticed, upon returning, the effect of the warping that had occurred, you would appreciate the effect of heat on thermoplastic materials. Heat not only causes expansion but softens the thermoplastic materials. When there is more heat on one side of a piece than another, a warp results, and especially when the material is softened. There is cold flow under such uneven stresses; cold flow becomes more severe as the temperature rises. Permanent distortion is the usual result.

In compression molding the cold powdered or granular plastics material is placed into an open cavity of the mold and the mold is closed on the material. The heat and pressure from the mold melts or softens the material so that is flows freely and fills out the cavity to its extremities. However, the thermoplastic materials the mold must be cooled after the cavity is filled out under heat and pressure in order to harden the plastics material. This takes considerably more time for the molding cycle due to the necessity of alternately heating and cooling the mold itself, which is a sizable amount of steel and slow to change in temperature.

Compression molding of thermosetting materials requires no change in the temperature of the mold during the molding cycle. The temperature and pressure required for softening the thermosetting material during molding is maintained and used for hardening the material by polymerization or curing. When the freshly molded piece has been permanently hardened with heat it can then be removed from the hot mold in the hardened condition.

Thermosetting materials require more curing time in compression molding than thermoplastic materials require for cooling with injection molding. These two methods are the most common production practices for the corresponding types of materials.

Now we can see how the type of plastics material, thermoplastic or thermosetting, definitely affects the production process. This is only one example of many of the effects on production.

The thickness of the piece being molded has a most decided influence on the length of the molding cycle, especially with thermosetting materials.

Due to the fact that plastics are such poor conductors of heat, a thick piece takes a long time to harden as a result of temperature change. The center of the thickest section of a piece would take longer to change in temperature because it is farther away from the heating or cooling surface.

The condition of this center must be observed very carefully during adjustment of the molding cycle. This is true of thermosetting materials because of their tendency to undercure at the center and to overcure at the surface. Fortunately, this condition does not exist with thermoplastic materials because they do not cure as they harden or set up. Warpage, bumps, and pits occur with thermoplastic materials due to uneven cooling. With compression molding of thermoplastics, pithines and trapped air is likely to occur in thick sections.

With thermosetting materials which have thick sections, the simplest remedy is to reduce the temperature and increase the time. This, however, slows down the production rate. Curing time for thick sections of thermosetting materials is very much longer than cooling time for a comparably thick section of a thermoplastic material.

There are two production methods which improve this condition with thermosetting materials: (1) radio frequency heating of the material prior to molding; (2) the injection of thermosetting materials by special processes.

In either case the material goes into the mold cavity pre-heated to approximately the molding temperature before final presure is applied for setting up. This saves much time required for heating of the material during molding and shortens the molding cycle.

Differences in materials themselves affect the molding cycle. Some harden fast and some harden slowly, depending upon the formulation. The material manufacturer can supply this information but only in a relative sense between materials. It is up to the molder to determine the rest depending upon the design of the plastics piece, the temperatures, the methods of molding, the mold itself, and the pressures applied.

Thus we can see how the type of material, either thermoplastic or thermosetting, can definitely influence production in many different ways. Generally speaking, thermosetting materials require more time for the molding cycle than thermoplastics.

Plastics scrap comes from excess material of the molding process in the form of sprues, runners, flashes, rejected pieces, shearings, punchings, drillings or other finishing or assembly operations.

Thermoplastic scrap can be salvaged and reused in a number of ways. It can often be ground and remolded again. Thermoplastics contain plasticizers for controlling their physical and molding properties. However, many thermoplastics lose a portion of their plasticizers in the molding process so that they cannot be used again for the same purpose. In this case, such materials will have to be used for a different purpose or reprocessed to replace the lost plasticizers.

Scrap from thermosetting materials that have been cured has no practical value at present. Molders discard thermosetting scrap.

Fillers are used in thermosetting materials for the same purpose that plasticizers are used in thermoplastics. For example, general purpose phenolic

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TOOL MEN MEET WITH CLEVELAND

By W. P. RUPPRECHT

The program committees of the Cleveland Chapters of the American Society of Tool Engineers and the Society of Plastics Engineers succeeded in providing a noteworthy program of common interest to both groups at Hotel Allerton, Friday, October 18th. Two outstanding plastics technicians were secured to discuss the relation of proper tool design to plastics products. In addition, one of the films, which received many compliments at the showing in New York in conjunction with the SPI National Plastics Exposition, was shown.

The Dow Chemical Company, Midland, Michigan, sent Russell R. Bradshaw, assistant manager, Plastics Development Division and Gordon B. Thayer, of the same division, to address this joint-meeting. Their topics were coordinated to give both Tool and Plastics Engineers a good picture of the relation of good mold design to efficient plastics production. Mr. Bradshaw's portion of the session was based on the experience gained in "on the job" solutions of plastics production difficulties encountered in mold shops distributed over a wide area and producing an equally wide variety of products. Mr. Thayer's discussion included techniques developed in the laboratory at Midland to correct these difficulties.

As author of "Plastics Molds," which is now appearing in its third edition, Mr. Thayer has gained an enviable reputation on the design of plastics molds. His background of practical experience in both molding and toolroom work, coupled with a wide knowledge of mold design and construction, has provided him with an intimate understanding of molding shop techniques and procedures.

"The Shape of Things to Come," a 30-minute film, in sound and color, depicts the procedures in modern plastics molding. Produced by Boonton Molding Company, Boonton, New Jersey, this movie was taken in the shops of one of the most progressive plastics molder in the country. It was an education to see the types of molds required to produce some very complicated parts which would baffle all but the more experienced mold designer.

ST. LOUIS HEARS KAZIMIER

By DAN OTTO

On Thursday September 19 the St. Louis Section held their first meeting of the fall season. The guest speaker was Mr. J. C. Kazimier of the Amos Molded Plastics Company, Edinburgh, Indiana, whose subject was, "The Desirability of Engineering Knowledge for Salesmen of Plastics."

Mr. Kazimier went into considerable detail on how to figure accurately molding costs of a finished molded plastic article both by injection and compression; breaking down actual molding costs, finishing costs and finally packing charges, etc.

The talk was very well received and was one of the most comprehensive ever given here on this subject.

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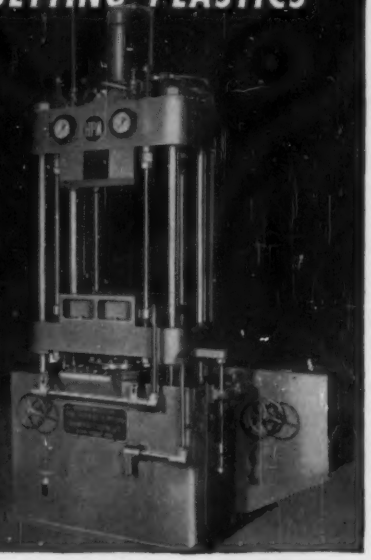

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CENTRAL OHIO NEWS

Mr. John Neuman, President of Nu Engineering, Inc., of Ferndale, Michigan, and Vice President of Newark Plastics, Inc., Newark, Ohio, has transferred his full time activities to the latter company. Because of the increased scope of activity of the two affiliated companies in the plastics field, Mr. Neuman has transferred his activity to the Newark plant to unify the sales contacts, development and experimental work, and engineering work for both companies.

MILWAUKEE TO MEET

On October 24, 1946, Maurice E. Marks spoke on "Plastics Testing and Its Relationship to Modern Plastics Development" before the Milwaukee Section.

Mr. Marks graduated from Brown University in 1934 obtaining the B.S. in Chemistry; in 1936 obtaining the M.S. in Chemistry. He spent one year at Rutgers University studying microchemistry. He is a member of Sigma Xi, Phi Lambda Upsilon, American Chemical Society, American Optical Society, and the American Society for Testing Materials. He is chairman of the plastic committee on strength in A.S.T.M. as well as chairman of the section on allyl plastics and is very active in all plastic testing work of this society. Mr. Marks has been associated with the development of allyl plastics, particularly in the field of testing and casting.

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NEWARK OUT FRONT

By EDWARD G. ACKERMAN

If the attendance and the interest shown in the Newark Section's first meeting of the 1946-47 season is any criterion, it may well be assured of a successful season. Already the Newark Section is way out in front of all other SPE Sections in new members elected.

The first meeting was held at the usual place, Newark Athletic Club. Following dinner, the members were addressed by Charles Breskin, Editor and Publisher of Modern Plastics Magazine who gave an interesting talk on "Plastics in 1946 and 1947." Mr. Breskin was followed by Burton E. Cash of the Celanese Plastics Corp., who had as his topic the new and interesting thermo-plastic material "Forticel." Also included in the evening's program was a motion picture entitled "Die Casting" supplied by the N. J. Zinc Company.

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WESTERN NEW ENGLAND SECTION MEETS

Western New England Section held its first dinner meeting on Tuesday, October 1st, at Hotel Sheraton, Springfield, Massachusetts. Mr. George Whitehead of Improved Paper Machinery Corporation gave a most interesting talk on "Current Developments on Injection Molding Equipment," and Mr. J. H. DuBois of Shaw Insulator Corporation and a National Director of SPE spoke on the aims and purposes of SPE.

SHERBURNE AT MIAMI

By J. G. BRADEN

On Thursday evening, October 3rd, the Miami Valley Section of SPE was honored to have as its speaker, Mr. A. J. Sherburne, Insulation Engineer of the Resin and Insulation Materials Division, Chemical Department, General Electric Company. Mr. Sherburne has been with this company for twenty-six years and has been closely associated with research, development and production of the company's insulating varnishes and compounds since 1928. When he joined the company in 1920, Mr. Sherburne worked on special problems of oil oxidation and turbine lubrication in their Research Laboratory. Eight years later he joined the laboratory's resin development section and was one of the original group of chemists who made up the engineering section of the Resin and Insulation Materials Division. At present Mr. Sherburne serves in a liaison capacity in connection with the Division's developmental, application and commercial activities as they relate to insulating materials.

Mr. G. J. Wilson has announced that a special meeting was held during the week of October 21st to discuss various program arrangements as well as methods of stimulating further interest in the Miami Valley Section.

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PHILADELPHIA REPORTS

By S. J. NOCITRA

The Philadelphia Section of the SPE held its first fall meeting on the evening of Sept. 16, 1946, at the Franklin Institute.

Dr. C. W. Gayler of the Viscose Corp. was the principal speaker, and he gave a lecture on "The Chemical Behavior of Resins." Dr. Gaylor's discourse dealt with HIGH AND LOW POLYMERS, BUTADIENES, POLYSTYRENES, PHENOLS, and other compounds of the benzene series. He explained how the bonds of these compounds may be changed to form new compounds, and how atoms may be added or removed, or their location on the benzine ring changed so as to form new compounds. His talk was well illustrated with picture slides of various charts.

Another feature of this meeting was the showing of a color film entitled "Fluorescent Lights." This film, donated by the General Electric Company, was partially animated and partially actual filming. It explained how a fluorescent light functions and showed the many steps required in the manufacture of a fluorescent light.

Mention must be made here of the delicious catered dinner that was served to the members in the Dairy Dell of the Franklin Institute before the meeting. All those present really had to loosen up their belts after consuming that tempting snapper soup and those tantilizing lobster croquettes.

The next meeting of the Philadelphia Section of SPE was held Monday, October 21st, with a dinner at 6:30 P.M. in the Dairy Dell of the Franklin Institute, and afterwards a lecture by Mr. J. S. Hurley, Jr., of the Resin and Insulation Materials Division, Chemical Department, General Electric Company, on "Silicones." As an added feature there was a film, "Exploring with X-Ray," which is contributed by General Electric Company.

TOLEDO HAS EXHIBIT

By E. J. SULLIVAN

The Plastics Display sponsored by the Toledo Section has appeared at its permanent location, the Museum of Industrial Science at the Toledo Zoo. It is planned to keep the display up-to-date as new products or materials are introduced. Though originating under the handicap of wartime conditions, the collection is a fair representation of the materials and products that are produced in the Toledo area. First shown at the Toledo Public Library, the display attracted much favorable comment. It is just another example of the progressive spirit that prevails among the members of the local Section.

Statistics will be forthcoming soon of the percentage attendance at the monthly meetings; impartial observers have stated that we set a mark for other Sections to shoot at.

The attendance at our monthly meetings is direct evidence of the quality of our speakers. Mr. F. W. Steere, Jr., of the Goodrich Chemcial Co., addressed the September 24th meeting and pleased the mem-

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NEWARK (Continued from Page 7)

Believing in the adage "All work and no play —," the Newark Section held its first annual outing last October 22nd at the Crestmont Country Club. Golf, soft ball, and the pitching of horseshoes whetted the appetites of all for the dinner which followed in the club house. Prizes were awarded to the winners of the various contests. "Orchids" to the Entertainment Committee and to Tony Terpak, chairman, for a gala time, one worthy of repeating again.

The next meeting to be held on November 13th will be addressed by Dr. Charles Marleis, Director of Research and Development of the Metaplast Corp. and Mr. Walter Toepel, Field Engineer of the Parker Kalon Corp. Dr. Marleis will have as his topic "Metal Coating of Plastics" and Mr. Toepel will discuss "Assembly Methods and Fastening of Plastic Parts." Both men will make use of the blackboard in their talks and have on display various samples and items pertaining to their respective subjects. A kodachrome motion picture entitled "Robots at Work" put out by the F. J. Stokes Machine Company will top off the evenings program. The film narrated by Lowell Thomas tells the story of complete automatic plastic molding methods and techniques.

It shall truly be a most interesting and informative evening so lets all attend. The time and place are as always . . . the second Wednesday of each month, November 13 at the Newark Athletic Club.

THERMOPLASTIC (Continued from Page 4)

plastics use wood flour in various amounts as a filler to improve the physical properties.

Pure phenolic resin is impractical to mold on the production basis because of its extreme brittleness after molding and the difficulties encountered in molding due to its low viscosity. In molding it would flow like water and leak or squirt through the smallest openings. The presence of wood flour thickens the material in molding and removes or reduces extreme brittleness of the molded product. The filler also lowers the material cost by its substitution for a considerable amount of resin.

Plasticizers and fillers will be discussed in detail later.

Practically all the thermoplastic materials are flexible and bend readily; at least all plastics of 1/16" or more in thickness, which can readily be bent with the fingers, are definitely thermoplastic. Thermosetting materials, with the exception already noted, are decidedly rigid and not subject to bending. They crack and break if bent even slightly. It is possible to get some degree of flexibility in very thin sections of thermosetting materials by the use of a laminated cloth base. The cloth tends to prevent cracking or snapping in two but the resin itself does break up when bent too far.

The application of external forces to thermoplastic materials also causes cold flow. Such forces may occur at assembly or in service. For example, the thin back of a small camera case, held in place by two light spring chips, was warped by the force of these chips. The result was that light leaked into the camera. A thermosetting material should have been used.

Absorption of certain liquids or chemicals causes swelling in the same manner that absorption of moisture causes swelling. Warpage results. On the other hand, certain liquids and chemicals remove part of the ingredients of the plastic material, causing shrinkage or cracking.

Thermosetting materials, in general, have very good dimensional stability throughout the conditions mentioned above. There are very few exceptions and these apply only in special cases. These exceptions will be discussed when we discuss each material individually.

Thermoplastic materials as a class are definitely soft as compared with thermosetting materials. One exception, perhaps, would be polystyrene plastics, as we shall see later. This is the one hard and brittle thermoplastic material, especially with certain common formulations. All thermosetting materials are hard.

Toughness and softness go together. On the other hand, brittlenes and hardness go together. This applies to materials other than plastics. The hardest of steels, for example, are very brittle, whereas the softest of steels are the least brittle.

As we have stated, all thermosetting materials are hard. If it were not for the addition of certain fillers to control their physical properties, in this case the property of impact strength, the thermosetting materials would all be brittle too. Laminated materials, especially, are of high impact strength, which is the term in plastics meaning toughness or lack of brittleness. Laminated plastics are made up of layers of cloth or paper which are impregnated with plastic resin and pressed out under heat and pressure to cure into a solid plate or block.

Thermoplastic materials are generally not laminated, partly because they are tough without being laminated and partly because they cannot be made as hard and as dimensionally stable as the thermosetting materials. Hardness and toughness is the ideal combination for most applications.

Thermoplastic materials are tough as well as soft, with the one exception of polystyrene.

Thermosetting materials have no noticeable cold flow characteristics, a distinct advantage of thermosetting materials which should not be overlooked.

The application of plastics fittings for aircraft is an excellent example of this property. For aircraft these fittings should be tightened lightly with a wrench in order to hold the pressures. Thermoplastic fittings cold flow in the course of time to relieve the forces of tightening and consequently relieve the tight seal, allowing leakage. They can be retightened time and time again and always flow out further. Thermosetting materials remain tightened indefinitely with no appreciable cold flow.

All thermoplastic materials become definitely brittle when they become cold. By cold we mean the

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THAYER AT N. W. PENN.

By PAUL C. ROCHE

Wednesday, September 11, marked the opening meeting of the 1946-1947 season of the Northwestern Pennsylvania Section, Society of Plastics Engineers, Inc. With about 50 members and guests in attendance a dinner meeting was held at the Hotel Kenyon, Erie, Pennsylvania.

The speaker of the evening was Mr. Gordon B. Thayer, Development Engineer, Dow Chemical Company, Midland, Michigan. Discussing "Design and Cost of Plastic Molds," Mr. Thayer covered very familiar subject matter, being a known authority on the mechanical phases of plastics manufacture, as well as the author of many writings on this subject including the book "Plastics Molds."

Mr. Thayer commenced by reminding the engineers present that one very basic factor has changed in the last year so far as the planning of plastics tooling is concerned, namely the fact that present operations are on the basis of free competition as against the expedience of producing critical war material under government contract when cost was necessarily secondary to speed. Whereas it is possible to go to an extreme in providing elaborate and expensive mechanical equipment, the advisability of doing so must be weighed against the finished product cost as well as cost of complementary tooling, the speaker stressed. The point was acknowledged also that a desire on the part of a manufacturer to keep his entire plant busy may affect materially the planning of tools, as against purely theoretical considerations.

Mr. Thayer based recommendations on some interesting statistics he had compiled. Having observed that tooling may represent between one and five per cent of ultimate dollar value of plastics products

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BROUGHTON AT BUFFALO

By CORT F. CARY

On Oct. 25th we had our first Fall meeting at the Westbrook Hotel. Mr. William Broughton of the National Lead Company discussed "Kirksite Molds for Plastics."

We have divided our Section into groups based on each individual's specialized interest in the plastics field. We hope to have each group keep the entire Section posted on developments within its field. This idea was suggested by E. R. Heckman, and we believe that it will help us keep abreast of things.

PLASTICS (Continued from Page 1)

Research rarely achieves real greatness where it is undertaken secretly by one man within the secrecy and confines of the four walls of one room. Even Edison and Bjorklund shared their findings with others for, being great scientists, they knew that others too had to understand what they were doing, else the full impact and value of their work would be lost forever.

INDIANAPOLIS EVENTS

By W. O. GEBHART

"Why Do You Want to Use Plastics?" was the thesis of a well planned and instructive discussion by Mr. W. J. Sharbaugh of the Gerber Plastic Company, St. Louis. All of this happened September 20th at the Athenaeum-Turners. Once again the salad was excellent.

Mr. Sharbaugh's plea was for more intelligent use of plastics. One or two improper applications will sour an entire industry on plastics even though many proper applications exist.

Each proposed use for plastics should be studied carefully to make certain that the article will be satisfactory, that the cost will be in line, and that the material needed is available.

If this procedure is followed, the plastics industry will grow and prosper. If it is not followed, disaster will result.

So Mr. Sharbaugh ended his discussion by again referring to his thesis "Why Do You Want to Use Plastics?"

Charter member Milo H. Buzzee has moved to Florence, Mass., to serve the Prophylactic Brush Company. We wish him success.

R. F. Pierce, The Visking Corporation, has transferred to the Indianapolis Section. We welcome you.

TOLEDO (Continued from Page 8)

bers with both his prepared talk and answers in the free-for-all that followed. Though his talk was billed as "The Physical Properties and Uses of Geon," his first utterances explained that he was going to talk on vinyls in general. Our local experts agreed that he did a good job of it, too.

On October 22nd, Dr. E. R. Perry of Westinghouse Mfg. Co., will speak on low pressure resins and adhesives. The usual fine dinner will precede the meeting at the Toledo Yacht Club.

Tentatively, it is agreed that a mixed meeting be held in the early part of 1947 with the ladies as guests. According to the members who have been present at such meetings they have been a great success. It is planned that the speaker selected be one whose talk will be of general interest such as Dr. E. A. Livingstone of DuPont de Nemours.

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THERMO PLASTICS (Continued from Page 9)

extreme temperatures encountered by aircraft—to 70° below zero. They become so stiff and rigid at this temperature that most thermoplastics are nearly as brittle as glass. Some, however, such as ethyl cellulose, cellulose acetate butyrate, and "Resistoflex," are decidedly better than the others and can at least be flexed a limited amount without danger of cracking.

On the other hand, all thermoplastic materials soften when heated. Aircraft specifications for plastics designates 180° F as the upper heat limit. All but a very few of the thermoplastic materials become much too soft for operation at 180° F.

Thermosetting materials show practically no change in brittleness or softness within this range of 70° below zero F to 180° F.

The time required to solidify or harden plastics material during molding ranges anywhere from a quarter of a minute to thirty minutes for the conventional molding materials. This time depends upon:

1. The nature of the molding process
2. The thickness of the piece being molded
3. The temperatures used
4. The nature of the plastic material.

All plastics materials are poor conductors of heat. Consequently, it takes a noticeable period of time to change the temperature of a plastics material in a mold. With thermoplastics, the material must be cooled in the mold in order to harden it before it can be removed.

Most thermoplastic materials are injection molded because of the high speed of production that is possible. With this method, the material, which is furnished in granular or powder form, is fed with a hopper and pushed by a ram into the heating cylinder where it melts or softens; it is then forced through a nozzle and on into a closed mold which is at a temperature lower than the softening point of the plastics material. The temperatures and pressures must be regulated in such a way that the softened material fills out the mold cavity completely before the material can harden. The pressure is maintained throughout cooling. Hardening by curing takes more time than hardening by cooling.

It is generally referred to among molders that the material is injected with a "cold" mold. It is cold only in a relative sense in comparison with the temperature of the softened material as it enters the cavity. Injection molding is the fastest method of molding thermoplastic materials due to the fact that the material goes into a "cold" mold where it may start hardening immediately.

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produced, the advisability of providing a highly developed mold to reduce processing time is normally justified. Likewise, whereas finishing operations normally represent approximately 37½ per cent of total production costs, it is apparently desirable to let the mold do as much of the work as possible toward substantial overall economies. He cautioned, however, against the use of "gadget" types of molds for producing production miracles.

The next meeting of the Northwestern Pennsylvania Section was scheduled for Thursday, October 10 at the Kenyon Hotel, Erie, Pennsylvania. On that occasion the speaker was Mr. Charles H. Frantz of American Plastic and Industrial Engineering Corporation, Detroit, Michigan, who addressed the group on "Estimating Manufacturing Costs and Establishing Selling Prices." This subject was selected on the basis of popularity in a poll conducted, being a companion subject to "Design and Cost of Plastic Molds" covered in the September meeting. In addition, a sound moving picture was shown covering "Completely Automatic Plastics Molding," courtesy of F. J. Stokes Machine Co., Philadelphia, Pa.

Since the last report an application has been received from Mr. R. J. Wilson, Jr., Design Engineer at Sylvania Electric Products, Inc., Warren, Pennsylvania.

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